

《甚高能宇宙伽马辐射》

图书基本信息

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内容概要

《甚高能宇宙伽马辐射:研究极端宇宙的关键窗口(影印版)》综述了宇宙伽马辐射这一现象的实验观测结果、起源的解释和蕴含的信息。其中主要探讨了宇宙射线的产生,相对论性射束的物理和天体物理,以及观测伽马射线宇宙学等研究方向。具体包括银河系内和银河系外的宇宙射线的起源、极端天体物理条件(比如正在吸积的黑洞附近)下的加速和辐射过程、伽马射线暴等瞬态现象,以及与之相关的宇宙学课题等。

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章节摘录

版权页：插图： On theoretical grounds, the diffusive shock acceleration model faces several challenges or "nasty problems" (Drury et al., 2001) like the "injection problem" and the "maximum energy problem", recently critically reviewed by Kirk and Dendy (2001), Drury (2001) and Malkov and Drury (2001). Diffusive shock acceleration requires particles with energy at least several times larger than the thermal energy of the plasma, and it is not yet clear how to get particles from the thermal pool accelerated to supra-thermal energies. Recent theoretical progress in this direction (e.g. Malkov and Sisk, 1995; Dieckmann et al., 2000) provides optimism that eventually the injection problem will be resolved, most likely through extensive numerical simulations (Kirk and Dendy, 2001). The problem of the maximum achievable energy problem is an old one and has a vital implication for the SNR paradigm of GCRs. In diffusive shock acceleration theory, the maximum energy of particles is achieved during the so-called free-expansion phase which, however, does not last long enough to allow acceleration of particles up to the highly desired point, the knee around 10¹⁵ eV. Therefore, violation of the so-called "upper limit" of Lagage and Cesarsky (1983), which, for the standard SNR parameters, the shock speed, duration of the free-expansion phase, and the ambient magnetic field, cannot significantly exceed 10¹⁴ eV, remains as one of the highest priorities of current theoretical studies. A promising way has recently been suggested by Lucek and Bell (2000). They showed that cosmic ray streaming drives large-amplitude Alfvén waves which may amplify the magnetic field non-linearly to many times the pre-shock value. Thus, the cosmic rays themselves provide the field necessary for their effective acceleration! The increased magnetic field reduces the acceleration time, and correspondingly increases the maximum particle energies to 10¹⁵ eV and even beyond.

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《甚高能宇宙伽马辐射:研究极端宇宙的关键窗口(影印版)》适合天文学、宇宙学、粒子物理等领域的研究者和研究生阅读。

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